Figure A - Function of tapered (coned) wheels

Floor of car

Solid wheel + axle assembly

Rails – points of contact

Flat track – no superelevation
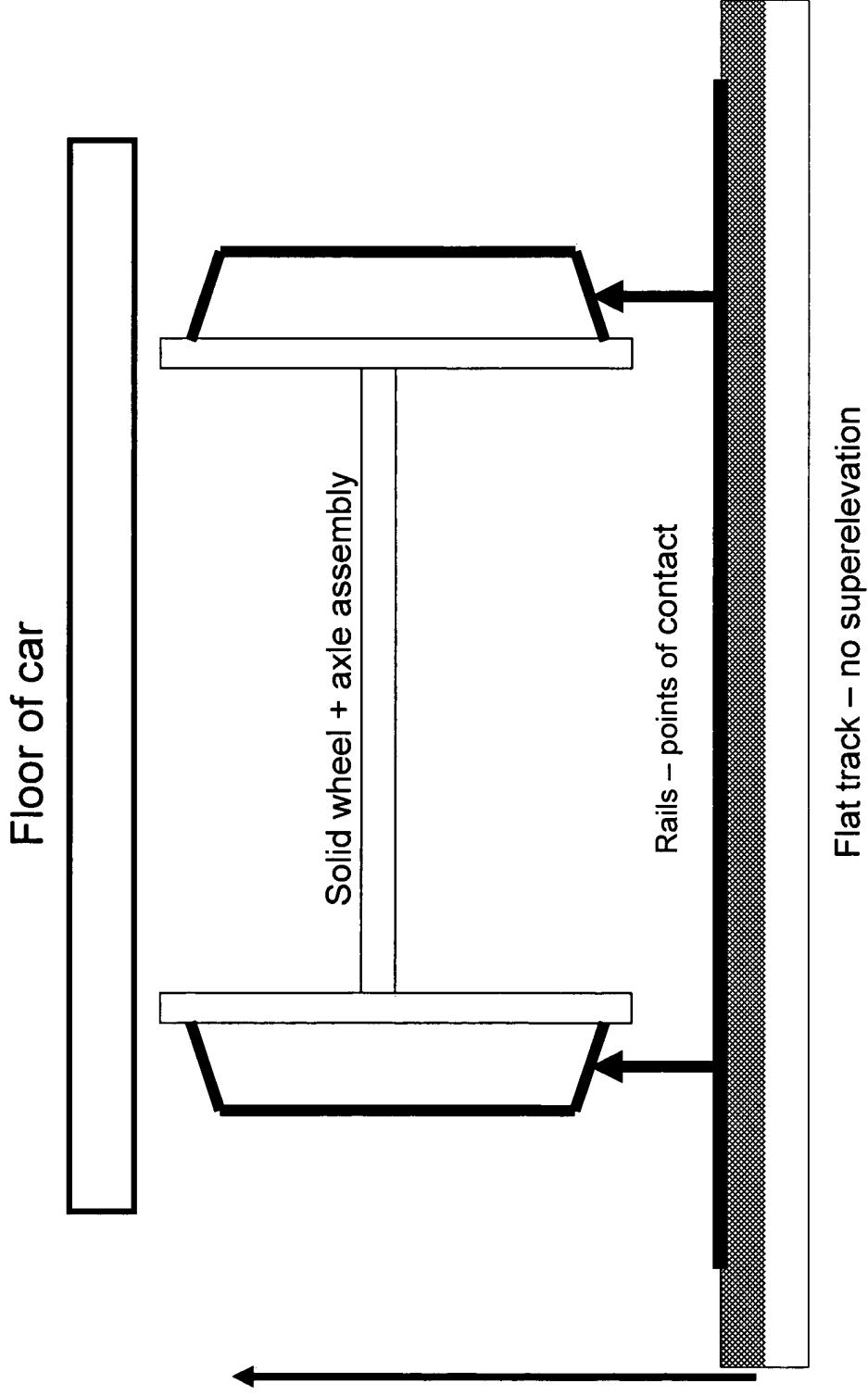
Tapered (coned) wheels are naturally self-centering while rolling down the track

Figure B - Function of tapered (coned) wheels : wheels on a curve

Floor of car

Wheel on smaller radius

Solid wheel + axle assembly

In curve, axle displaced slightly to left

Rails – points of contact

Wheel on Larger radius
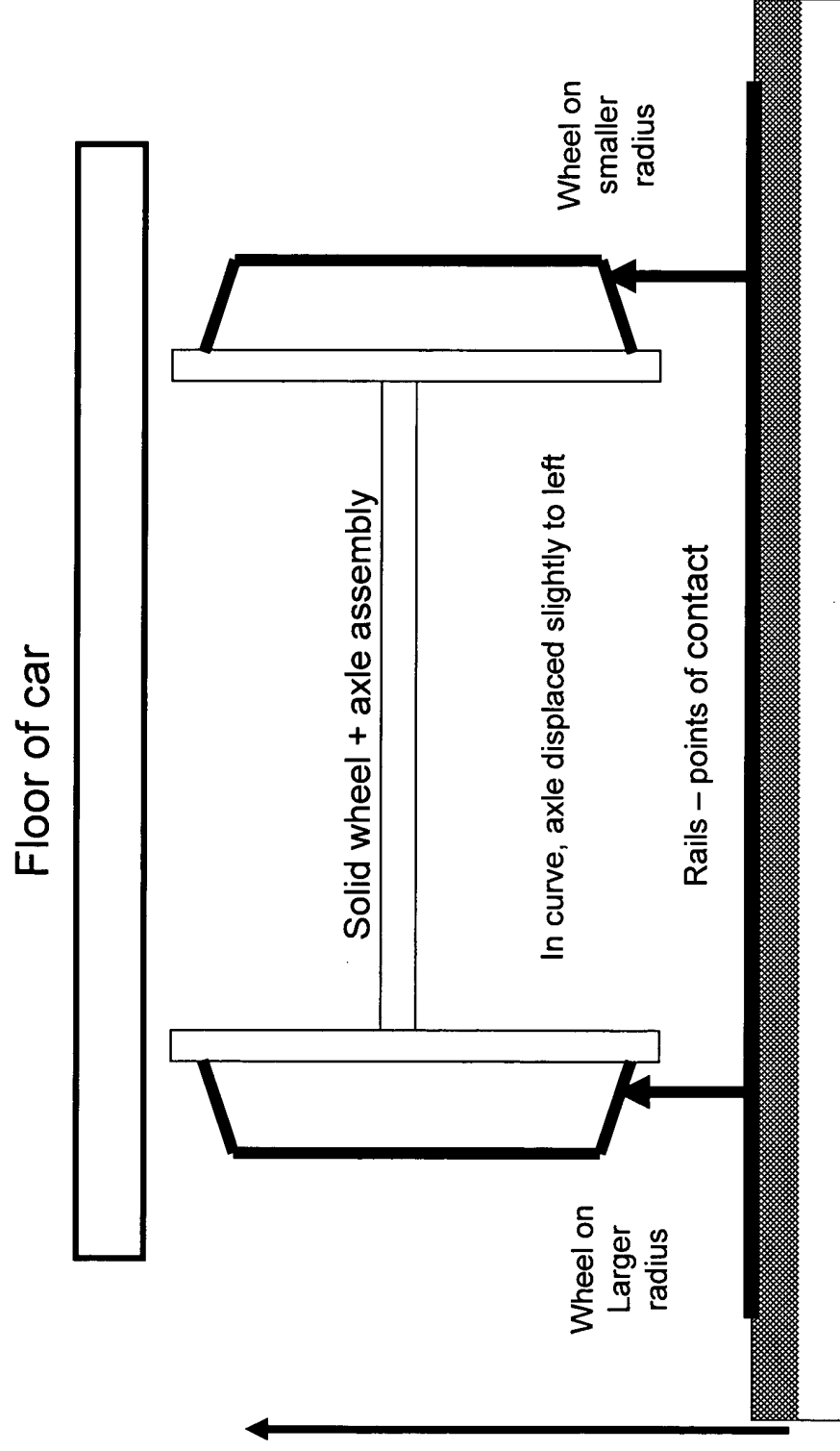
Flat track – no superelevation

Natural curving : difference = diameter outer wheel minus diameter inner wheel

Natural curving radius on inner rail = Gauge x diameter inner wheel / difference

Figure C - Steel wheel at speed on main line curve : outer rail

Rolling friction resists side forces, no sliding friction

Flange of wheel

Centrifugal sideways force at railhead 0.15G

Net reaction of load down through rail Angle 8.5°

Vehicle weight on top of railhead 1G

Friction resists sideways sliding

Tread of wheel
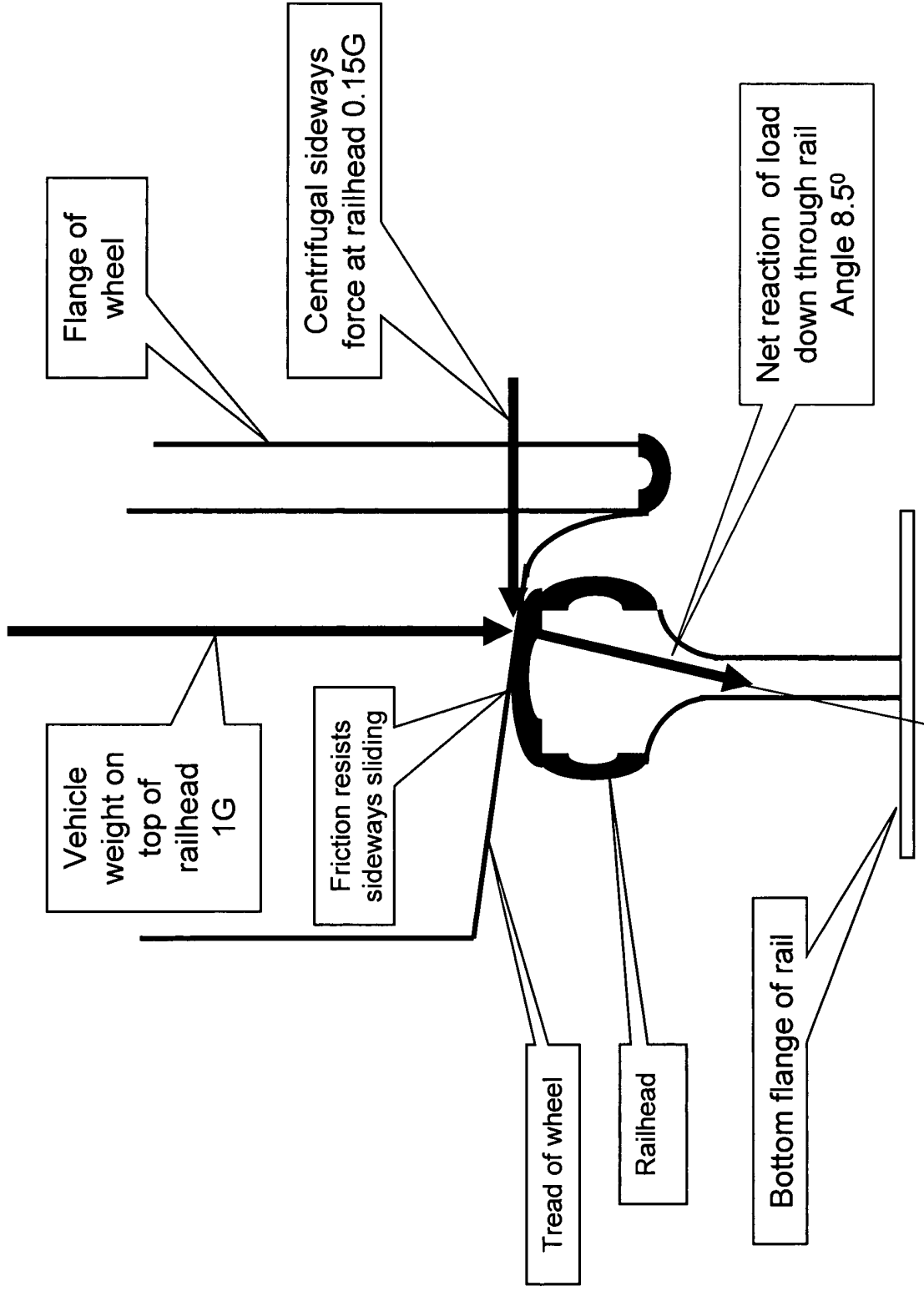
Railhead

Bottom flange of rail

Figure D - Steel wheel on sharp curve : outer rail

Sliding friction at flange and at tread

(The cause of squealing wheels)

Flange of wheel

Friction as flange presses against side of railhead

Vehicle weight on top of railhead

sideways force slides wheel against flange

Tread of wheel

Railhead